

Shin WATANABE\*: **Some Palmogloeacean algae (Chlorococcales)  
from Japanese soils**

渡辺 信\*: 日本産土壤藻パルモグロエア科(クロロコックム目)の数種

In the course of the taxonomic study on soil algae, ten green algae belonging to Palmogloeaceae, Chlorococcales were isolated by the method reported previously (Watanabe 1977) from different localities listed below. They form a common matrix around cells, have a parietal chloroplast with or without pyrenoid and lack zoospores. After investigations under light microscope, it became clear that eight isolates are identical with *Palmogloea protuberans* or *Coccomyxa subglobosa*, and the remaining two are new taxa belonging to these species. The present paper deals with description of the two species, a new variety and a new forma.

The cultures of the newly described organisms have been deposited in the Culture Collection of Algae, Institute of Applied Microbiology, University of Tokyo.

**Localities of soil samples**

Symbols of the localities

- EBO: The secondary forest at Mt. Eboshidake in Nagasaki Prefecture.  
IWA: The secondary forest of *Pinus densiflora* in the northern part of Kyoto City.  
KIY: The primary forest of *Castanopsis cuspidata* in the eastern part of Kyoto City.  
KUC: The campus of Kyoto University, Kyoto City.  
OGA: The shoulder of a road in Chichi-jima, one of Ogasawara islands in the Pacific Ocean. Lateritic soil.  
TAR: Wet grassland at Tarodaira near Mt. Yakushidake in Toyama Prefecture.  
TOT: The coastal dune in Tottori Prefecture. In the garden of the Sand Dune Research Institute of Tottori University, where *Pinus thunbergii* is planted.

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YAW: The bank of the Yodo River in Yawata Town, Kyoto Prefecture, dominantly occupied by *Solidago altissima*. Wet sandy soil.

**Palmogloea protuberans** (Smith et Sowerby) Fott et Nováková var. **protuberans**; Nägeli in Gatt. Einzell. Alg., p. 65, pl. 4, f, 1849, (as *Gloeocystis vesiculosa*); Fott in Algenk. 2 Aufl. p. 315, fig. 191, c, 1971, (as *Gloeocystis vesiculosa*); Fott et Nováková in Arch. Protistenk. 113, p. 322, pl. 43-46, 1971. (Fig. 1, 1-7)

Cells surrounded by a gelatinous common matrix. The abundance and the number of stratification of the matrix varying among the isolates; cells covered with non, one or several layers, or poorly covered because of the poor accumulation of the matrix. Young cells ellipsoidal or ovoid, and adult ellipsoidal, subspherical or sometimes spherical. Cells  $2.5-7 \times 4-11 \mu\text{m}$  in size or  $8 \mu\text{m}$  in diameter. The cell wall thin and not thickening in old cultures. The chloroplast saucer-shaped, broad band-shaped or cup-shaped with smooth or slightly undulate margin, occupying  $1/2-2/3$  of the cell's periphery. The pyrenoid single or sometimes plural (2-4), spherical, ellipsoidal, elongate-ellipsoidal or broad crescent-shaped, and naked or covered with a small amount of minute starch grains. The nucleus and nucleolus rarely observable in living cells. Vacuoles sometimes present.

Reproduction by forming 2-8 autospores. Mother cell wall rapidly hydrolyzed and usually not observable.

Plant mass green throughout the culture period, slimy, forming mounds on agar medium in old cultures.

Culture No. KUC 17-1, YAW-128, TOT-43, TOT-48, 3-EBO-6, IWA-9. var. **elegans** S. Watanabe, var. nov. (Fig. 1, 8-12)

A typo differt granis amyli circum pyrenoidem magnioribus et plus arte dispositis.

Origo: Plantae e solo in summo montis Eboshidake, in Nagasaki-ken dicto, m. Aug., 1975 lectae; numerus culturae, 1-EBO-1.

Typus: Fig. 1, 8-12.

Cells surrounded by a gelatinous common matrix with or without stratification around cells. In actively growing cultures, cells ellipsoidal or spherical and in older cultures, subspherical, spherical, and  $2-6 \times 3-7 \mu\text{m}$  in size or  $3-8(-10) \mu\text{m}$  in diameter. The cell wall thin and not thickening in old cultures. The chloroplast in young cells saucer-shaped, occupying about

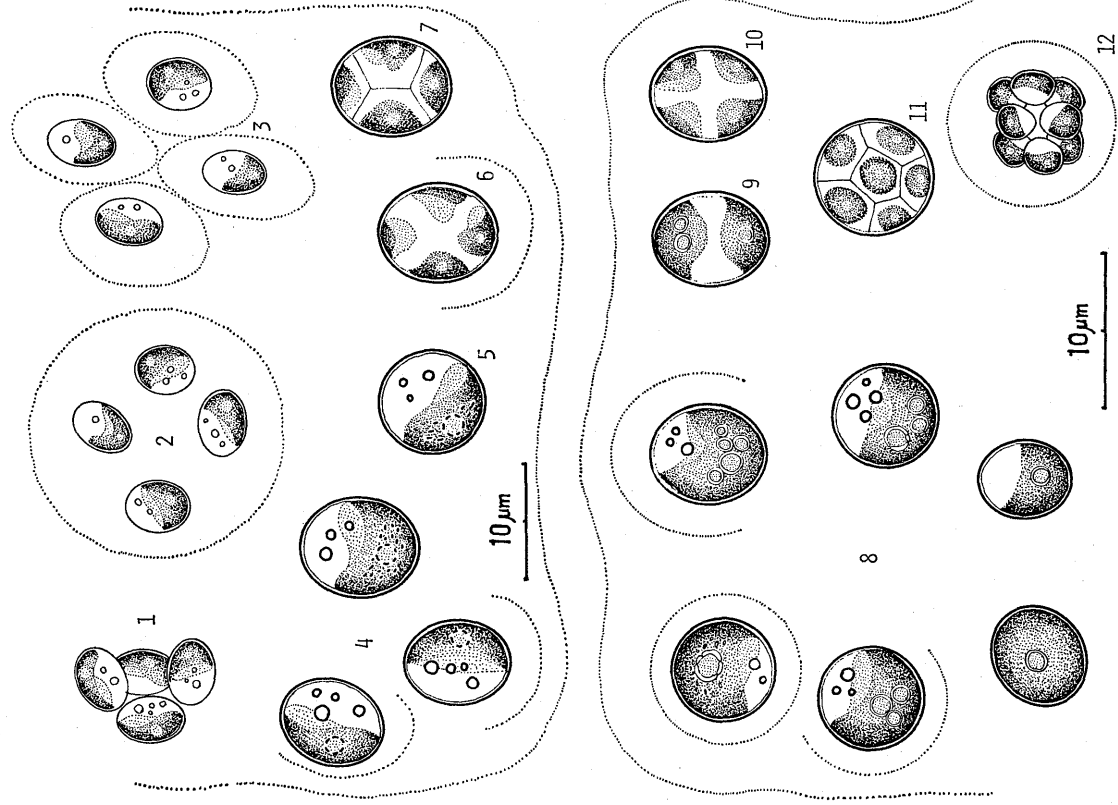


Fig. 1. 1-7: *Palmogloea protuberans* (Smith et Sowerby) Fott et Nováková var. *protuberans*. 1-3, young cells. 4 and 5, adult cells. 6, a cell with divided chloroplasts. 7, a cell with dissepiments. 8-12: *Palmogloea protuberans* var. *elegans* S. Watanabe, var. nov. 8, adult cells. 9 and 10, cells with dissepiments. 11, a cell with dissepiments. 12, young vegetative cells.

half of the cell's periphery; and in adult, mantle-shaped or bowl-like with a smooth margin, occupying  $1/2-4/5$  of the cell's periphery. The chloroplast incised narrowly before the cell division. The pyrenoid spherical or subspherical, occasionally plural (2-5) in actively growing cultures but usually single in old cultures, covered with several saucer-shaped starch grains which are closely arranged. Stroma starches freely present in the chloroplast. The nucleus not observable in living cells. Vacuoles sometimes present.

Reproduction by forming 4-8 autospores which are formed by successive bipartitions. Mother cell wall rapidly hydrolized and scarcely observed.

Plant mass green throughout the culture period, slimy, amorphous, forming mounds on agar medium in old cultures.

The characteristics of this isolate coincide with those of *P. protuberans* with some exceptions, and it is considered to be a new variety of this species. The cell of var. *elegans* is generally spherical in form and has a larger chloroplast than that of var. *protuberans*. The form of the starches around pyrenoids is another characteristic distinguishing these two varieties. In var. *elegans* the pyrenoid occasionally divides and is covered with several saucer-shaped starch grains which are closely arranged. In var. *protuberans*, on the other hand, the pyrenoid is usually single, and naked or sparsely covered with small starch grains which are the same size as the free stroma starches.

**Coccomyxa subglobosa** Pascher in Süsswassfl. 5, p. 210, fig. 5, 1915; Akiyama in Mem. Fac. Educ., Shimane Univ., p. 58, 1970. (Fig. 2, 1-6)

Cells surrounded by a common matrix with or without startification around individuals. Cells ellipsoidal, sometimes subspherical or spherical, and  $3-6 \times 4-7 \mu\text{m}$  in size (rarely  $12 \times 13 \mu\text{m}$  in size in unhealthy cells). The cell wall thin and not thickening in old cultures. The chloroplast saucer-shaped or bowl-like with a smooth margin, occupying  $1/2-2/3$  of the cell's periphery. The pyrenoid lacking. The nucleus and nucleolus sometimes visible in living cells. Vacuoles absent, and oil droplets present.

Reproduction by forming 2-4(-8) autospores which are formed by successive bipartitions. The mother cell wall hydrolized rapidly and not observable.

Plant mass green throughout the culture period, smooth, forming mounds on agar medium.

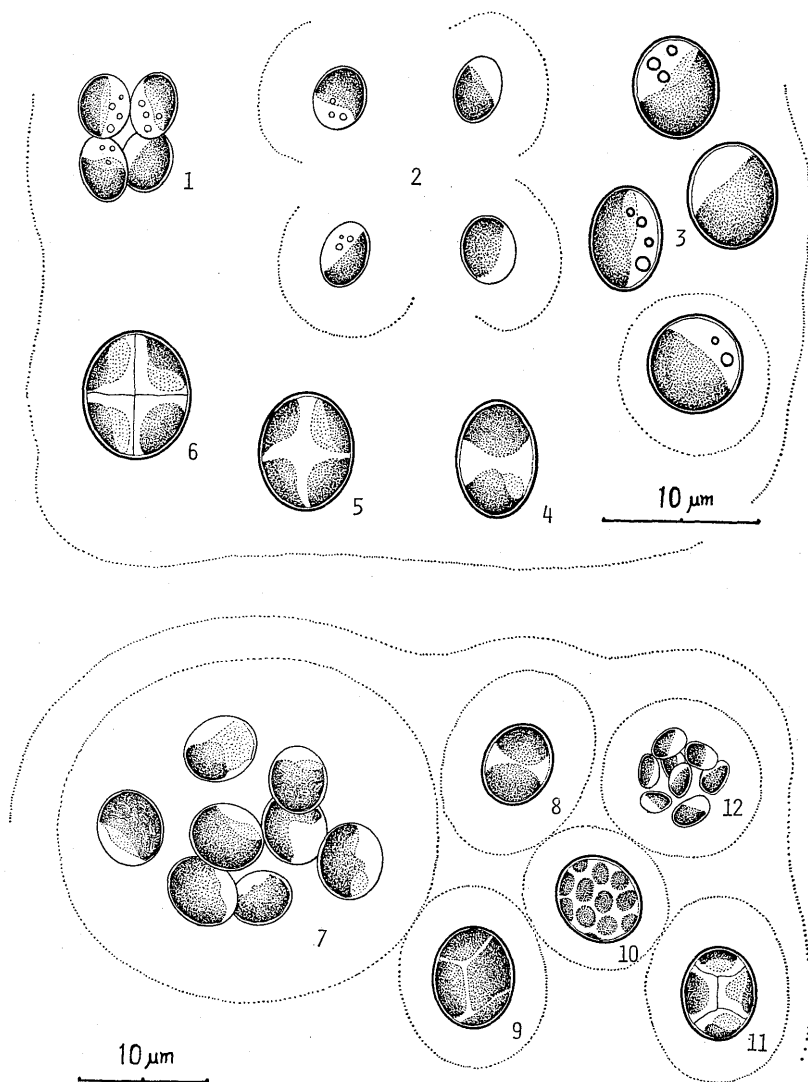


Fig. 2. 1-6: *Coccomyxa subglobosa* Pascher. 1 and 2, young cells. 3, adult cells. 4 and 5, cells with divided chloroplasts. 6, a cell with dissepiments. 7-12: *Coccomyxa subglobosa* f. *scabera* S. Watanabe, f. nov. 7, adult cells surrounded by common layer. 8-10, cells with divided chloroplasts. 11, a cell with dissepiments. 12, young vegetative cells.

Culture No. 1-TAR-1, 11-OGA-1.

f. *scabera* S. Watanabe f. nov. (Fig. 2, 7-12)

A typo differt autosporis pluribus; massa plantarum scabro in cultura vetere.

Origo: Plantae e solo sylvae *Pini densiflorae* in loco Kyoto-shi dicto, m. Dec., 1972 lectae; numerus culturae, KIY-26.

Typus: Fig. 2, 7-12.

Cells surrounded by an amorphous but relatively firmer matrix with a single layer around individuals. Cells sometimes free from the matrix when they are pressed down during the preparation for microscopic observations. Cells in actively growing cultures ellipsoidal, ovoid or subspherical, and those in older cultures broad ellipsoidal or subspherical, and  $2-6 \times 3-8 \mu\text{m}$  in size. The chloroplast saucer-shaped, occupying about half of the cell's periphery in young cells, and bowl-like with a smooth margin, occupying  $2/3-4/5$  of the cell's periphery in adult. The nucleus not observable in living cells. Vacuoles sometimes present in old cells.

Reproduction by forming 2-16 autospores. Usually the mother cell wall hydrolized rapidly and not observable, but in old cultures an empty mother cell wall sometimes left in irregular shape.

Plant mass green throughout the culture period and rough at surface in old cultures.

This isolate possesses characteristics identical with those typical of *C. subglobosa* with some exceptions, and is considered to be a new forma of this species. In f. *subglobosa* 2-4(-8) autospores are produced and the plant mass is smooth at surface, forming mounds, but in f. *scabera* 2-16 autospores are produced and the plant mass is rough.

### References

- Akiyama, M. 1970. Some soil algae from the arctic Alaska, Canada and Greenland. Mem. Fac. Educ., Shimane Univ. 4: 53-75. Fott, B. 1971. Algenkunde. 2. Aufl. 581 p. Stuttgart. — 1974. Taxonomie der palmeloiden Chlorococcales (Familie Palmogloeaceae). Preslia. 46: 1-31. Fott, B. & M. Nováková, 1971. Taxonomy of the palmelloid genera *Gloeocystis* Nägeli and *Palmogloea* Kützinger (Chlorophyceae). Arch. Protistenk. 113: 322-

333. Jaag, O. 1933. *Coccomyxa* Schmidle, Monographie einer Algengattung. Beitr. Kryptogamenflora der Schweiz 8: 132 p. Bern. Nägeli, C. 1849. Gattungen einzelliger Algen. 139 p. Zürich. Pascher, A. 1915. Einzellige Chlorophyceangattungen unsicher Stellung. Süßwasserflora von Deutschland, Österreich und der Schweiz. 5: 206-229. Watanabe, S. 1977. The genus *Chlorella* (Chlorococcales) from Japanese soils. Journ. Jap. Bot. 52: 97-106, 129-136, 169-178.

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日本各地の土壌からパルモグロエア科 (クロロコックム目, 緑藻) の 10 藻株を分離し, 分類学的研究を行った。そのうち 6 藻株は *Palmogloea protuberans* と同定され, 1 藻株はこの種の新変種として var. *elegans* の名が与えられた。var. *protuberans* ではピレノイドは通常 1 つで, 少量の小さなデンプン粒にとりかこまれるのに対し, var. *elegans* ではピレノイドはしばしば複数で, より大きな連続したデンプン粒にとりかこまれている。また 2 藻株は *Coccomyxa subglobosa* と同定され, 残る 1 藻株はこの種の新品種として f. *scabera* の名が与えられた。f. *scabera* は f. *subglobosa* よりも多くの自生孢子を形成し, また寒天上の藻塊の表面が荒いことで, これが滑らかな f. *subglobosa* とは異っている。

□The Staff of the L.H. Bailey Hortorium: **Hortus Third**, a concise dictionary of plants cultivated in the United States and Canada. p. xiv+1290, Macmillan Publishing Co., New York, 1976, \$99.50. L.H. Bailey がはじめ, ついで娘に, やがて L.H. Bailey Hortorium となって受けつがれて来た計画が Hortus (1930), Hortus Second (1941) を経て大成したもので, 米国, カナダ, ハワイ, プエルトリコで栽培されている園芸植物を, 植物学的な基盤からまとめている。科は 281, 属は 3301, 種は 2 万をこすものが集大成されているから, 異名をふくむと優に 3 万 4 千種をこえる。まことによく集められていて, 属及び科の ABC 順に, 更に種を異名をも加えて ABC 順に記し, 適切な植物学的記述を附記すると共に, 品種もよく挙げられ, その異名まで記し, 主な種には栽培法も書いてある。科毎に代表的の属を取上げてすなおな図がついている。ここ 35 年間に米国を主にして登場したものを網羅する一方, 旧版に出ていて今は植えなくなったものは, 思い切ってはぶくなどかなりの手を加え, 大変新らしくなったといえよう。末尾に著者名 (生歿年を附記), 記載用語, それから英名の表があるのは大変参考になるだろう。

(前川文夫)